

Employment of

Continuing education a major factor in career success

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■ Third-quarter earnings are up for most U.S. chemical companies, even though sales are down in some cases. **Page 7**

■ Robert C. Brasted, member of the ACS Board of Directors, dies of cancer at age 71. **Page 8**

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Employment Outlook

C&EN's annual look at the job market focuses on the expanding continuing education programs for chemists and chemical engineers that help them improve creativity and keep from falling behind in professional knowledge. **Page 29**



European Executives Bullish Over Outlook for Petrochemical Industry

Favorable factors cited include improving economic growth prospects, freer market in oil prices, benefits of restructuring moves

Dermot A. O'Sullivan, C&EN London

William Shakespeare wrote, "What's past is prologue." It may have been with this premise in mind that the European Petrochemical Association's 20th annual meeting in Monaco recently chose its theme—the petrochemical industry over the past 20 years: have we learnt our lessons, and can we apply them in the future?

Jacques Puechal, president of Paris-based Atochem, one of France's leading petrochemical concerns, opened the session with a brief look back at how the French petrochemical industry has changed. In the mid-1960s, acetylene still was a basic material for making acrylonitrile, vinyl chloride, and the like, he points out. French ethylene capacity stood at about 900,000 tons a year in contrast with today's 2.48 million tons.

The rise in ethylene production stemmed from the rapid growth of fuel consumption, which in turn made naphtha available in large quantities and at a low price, he notes. "Furthermore, bulk plastics were developing, which increased demand for ethylene. This helped newcomers enter the business and build production sites beside existing ones."

The first attempts at restructuring the French petrochemical industry occurred in the 1970s with the emergence of ATO Chimie, Produits Chimiques Uguine Kuhl-

mann (PCUK), and Rhône-Poulenc, Puechal recalls. Based on overoptimistic demand forecasts, decisions were taken to put up new units. Although older ones were shut down, overcapacity continued because the rate of market growth slowed at about the time the new plants came on stream. Moreover, new producers outside the European Economic Community were coming onto the scene.

During the 1982 recession the situation became "catastrophic," as Puechal puts it. This led to the second reshuffling of the French industry under a government-inspired plan (C&EN, April 2, 1984, page 22). PCUK ceased to exist, and Rhône-Poulenc essentially withdrew from the business. Basic petrochemicals output in France now is confined to Atochem and CdF Chimie, together with British Petroleum, Exxon, and Shell, he notes. "Capacity reductions were accomplished, and this process is not necessarily at an end," Puechal notes.

"What happened in France may be seen as a special case," he says. "I don't think so. Building up, then restructuring the petrochemical industry has not been very different in other countries," he maintains.

"What seems to me of the utmost importance is our concern to continue strategic moves in the European petrochemical business. This is needed to maintain our competitiveness, to keep on upgrading our units, and to replace the aging ones.

"Some moves have been achieved in this direction during the past few years. Now we should not lose time, even if the present economic situation is more profitable to us. We have to improve our profitability so as to be able to [cope with] international competition and an ever-possible depression.



Puechal: continue strategic moves

"A fundamental change has been the emergence of newcomers in low-cost raw material countries or in areas with developing markets. Capacity is growing, and these newcomers are disrupting 'traditional' European markets and our export markets. These new producers will not give up, and we—Europe, Japan, and the U.S.—have to share the burden equally."

Turning to pricing policies, Puechal reminded his listeners that when there is an increase in raw material costs, it is difficult and takes time to transfer this to the price of the end products. On the other hand, when feedstock prices decrease, the lower cost is rapidly applied.

"Pricing stability can develop confidence of the downstream industry and increase the penetration of petrochemical products," he maintains. "Salesmen must have the nerve to resist buyers' arguments.

Trying to gain market share when there is overcapacity can deeply alter profitability of operations and bring new fluctuations." Nevertheless, Puechal professes confidence in the future of the petrochemical industry in Western Europe.

Also expressing optimism is Tom O. Hutchison, Imperial Chemical Industries' director in charge of petrochemicals and plastics with responsibility for continental Europe. "I associate myself with a moderate, yet rising, sense of optimism regarding the future of the industry in Europe," he says. "A number of significant factors are in our favor. It is up to us to take full advantage of them. If we don't, someone else in the world will."

The favorable factors he cites are a greater sense of economic realism within the industry, improving economic growth prospects, the freer market in oil prices, changes in Middle East developments, and the benefits arising from rationalization moves.

Throughout the 1960s, and during much of the 1970s, Hutchison recalls, a number of West European chemical producers decided to enter sectors of the industry and invested large sums of cash on projects that had little foundation in economic reality. "Price was often the only means of gaining market share, and resulting market disruption was commonplace," he notes.

"I now see signs that attitudes are changing," he says. "Many companies have achieved a substantial market position in selected products, and now have a considerable vested interest in market stability. In addition, governments, at one time guilty of profligate spending, are indicating a hardening attitude toward 'lame duck' projects. This new sense of realism is vitally needed throughout our industry, and must be maintained."

The price of oil, and the prospect for improvement in economic growth are interlinked. Oil now is priced at about \$12 to \$15 a barrel, roughly half what it was at its peak. The consensus is that it will remain at around the current level for some time.

"Although the Organization of Petroleum Exporting Countries is

European ethylene, plastics capacity changed since 1980

Billions of lb	Capacity, end of 1980	Capacity, phased out 1980-88	Capacity added	Current capacity	Capacity change, %
Ethylene	40.00	12.72	2.76	30.04	-25%
Polyethylene, low density	14.76	3.60	—	11.16	-24
Polyethylene, high density	6.07	1.01	—	5.06	-17
Polypropylene	5.54	0.73	1.32	6.13	11
Polystyrene	5.20	0.68	0.33	4.85	-7
Polyvinyl chloride	13.10	1.87	0.33	11.56	-12

Source: ENIChem

likely to re-establish greater influence in the 1990s, I believe its members have learned from the past, and that future oil price increases will be progressive rather than discontinuous," Hutchison predicts. "The prospects, at least for the next few years, are for oil to be influenced principally by a freer market. As a result, we will have to live with continuing oscillations in oil and gas prices. Those petrochemical producers who can accommodate greater flexibility in their feedstock use will see a handsome competitive dividend."

He acknowledges that the drop in crude oil prices late last year has not yet fed through to improved economic growth for the industrialized world. And although that growth unlikely will match "the heady levels" of the 1960s, he expects it to return to the rates of the 1970s, namely, annual growth of between 2.5 and 3% in gross national product. "That would be a notable improvement on the recent past," he points out.

Petrochemical producers will benefit in a number of ways, Hutchison says. For instance, energy costs now are back to the levels prevailing before the 1973 Arab oil embargo, and raw material costs have fallen substantially. Although the subsequent rise in profit margins is unlikely to be fully sustained, a significant improvement probably will be realized. Increasing demand probably will lead to higher levels of plant capacity use.

In contrast to the concern expressed a few years ago about threats from the buildup of petrochemical production in Saudi Arabia, Hutchison now feels more secure about the future. It is true, of course, that

large tonnages of products from Saudi plants have found their way into Western Europe and that additional quantities have cut into markets long served by West European makers. "Much of this product now has been accommodated," he says, "and I foresee less of a threat arising from the plants under construction and yet to be started up there."

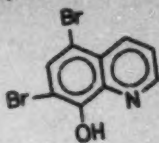
Substantial moves have been made in the past few years to bring production capacities of plants making ethylene and the bulk thermoplastics made from it more into line with anticipated demand and growth rates. These, together with restructuring steps, were highlighted by Charles M. Doscher, chief operating officer of Milan-based EniChem, the chemicals arm of Italy's Ente Nazionale Idrocarburi, when he addressed the European Chemical Market Research Association meeting in Antwerp recently. During the



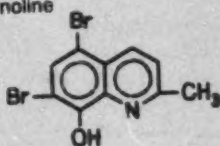
Hutchison: attitudes are changing

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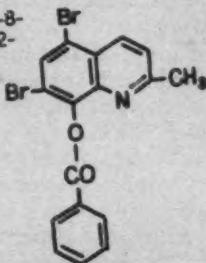
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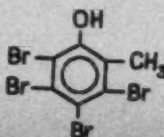
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International Business

past six years, for instance, ethylene capacity was pruned 25%, that of low-density polyethylene 24%.

The reductions have had a positive impact on capacity utilization. According to Doscher's figures, the average now stands close to 96% for polypropylene, 89% for LDPE/linear LDPE, 84% for both ethylene and high-density polyethylene, 83% for polystyrene, and 82% for polyvinyl chloride, based on nameplate capacities, which usually are 5 to 10% greater than the available capacities. The 1981 use rates, by comparison, were 75% for polypropylene, 62% for LDPE/LLDPE, 71% for ethylene, 64% for HDPE, 60% for polystyrene, and 64% for PVC.

"By a combination of attrition in capacity, buoyancy in the market, and an oil glut, the picture today looks less critical, and the industry less in need of major surgery. But before we all start congratulating ourselves and pronounce the crisis over, the margin improvement achieved has not left the bulk plastics' producers in a position where their returns on investment are sufficient to pay for rebuilding of aging plants," Doscher hastens to add.

"Since updating productive assets is an acid test of the health of any business, the point needs to be emphasized. I am not talking here of capacity additions, but the need for a 'scrap and build' policy that is just as much part of restructuring as plant closures."

ICI's Hutchison concurs, and voices concern about "the advancing age of the [European petrochemical] industry's assets. Many old plants have been closed. But there has been little opportunity to build new plants in the past five years, and the 'average plant' now is about mid-1970s vintage. There will in time be a growing and eventually urgent need for the replacement of existing assets.

"Few responsible [management] boards will be reaching for their checkbooks to replace bulk chemical plants even at today's somewhat improved level of return on investment. In the long term, this presents a problem for which I see no immediate solution other than the creation of a driving force for yet further concentration."



CAEN staff photo

Doscher: need scrap and build policy

In this connection, Hutchison points out, "there still are far too many producers of several important products." In the case of ethylene, for instance, the number has moved down only marginally to 28, from 31 in 1975. Likewise for HDPE, there are 16 now against 18 in 1975, 17 in polystyrene against 20. Indeed, the number making polypropylene has moved up to 16 from 11 over the same timespan. "Our colleagues in synthetic fibers have substantially changed the shape of their industry [in Europe]. We would do well to emulate them," he suggests.

"This brings up the sensitive issue of competition," Hutchison continues. "In Western Europe, there are many factors and attitudes in each country that make it difficult to achieve the restructuring which is necessary. While most of these can be overcome, more difficult are those aspects of competition policy within the EEC Commission that inhibit restructuring.

"There already have been some mergers and joint ventures within EEC," he admits, "which leads me to believe that neither national governments nor the commission are wholly opposed to the concept. But the process of receiving clearance or exemption from the commission is painfully slow."

He cites the case of his company's agreement to take over BP Chemicals' PVC operations in ex-

change for ICI's LDPE business in the U.K. "It took 18 months after the notification before exemption was announced," he recalls.

EniChem's Doscher maintains that "if management adopts a flexible and open-minded approach to the problems, we are going to be closer to a solution." He illustrates his point with two examples drawn from his own experience. One involved EniChem's leasing for 10 years the LDPE plant of Hoechst's Ruhrchemie subsidiary in Oberhausen, West Germany. At the same time EniChem phased out some LDPE capacity in Italy.

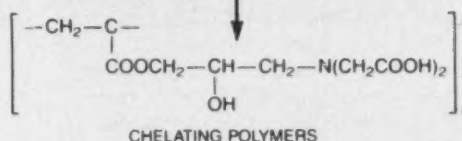
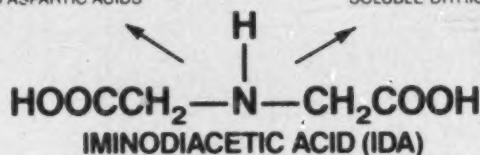
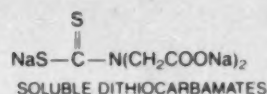
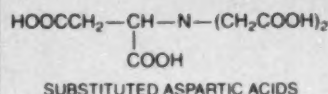
"The result has been quite positive," he points out. "Hoechst, which was seeking a way of getting out of LDPE without writing off expensive plant, has achieved its goal. EniChem wanted a Northern European production facility for strategic commercial reasons, but did not want to build additional capacity."

Doscher's other example centers on a joint venture between EniChem and ICI in PVC, called European Vinyls Corp. "Both companies were integrated producers. By leaving the assets with the parents, the two companies were able to construct a mechanism that allowed the right degree of flexibility at plant level while ensuring that the new venture had the necessary resources to fulfill its mission."

Looking to the future, Doscher maintains that "what needs to be done most is to examine carefully the way we approach innovation and specialized product segments. Today's commodities were specialties once, and those who ignore history are in great danger of repeating it. European companies need to be acutely aware of who is doing what in terms of innovation so that we don't duplicate each other's work."

"It is entirely possible that collaborative research and innovation approaches are the only way we can ever expect to create a healthy chemical industry over the next two decades. Only then can we have reasonable hope that managers of the 21st century will not need to undertake the painful rationalization that today's managers have come to regard as part of the job." □

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1987 Employment Outlook



Career Opportunities for Chemical Professionals

Chemists and chemical engineers generally found it harder to get jobs this year than they did in 1985. A sizable problem was that many large employers decided to reduce their costs by cutting back on their hiring of all types of employees, including chemical professionals. Especially hard hit this year were petroleum companies, whose profit picture had worsened to such a degree that they were able to offer chemists and chemical engineers relatively few positions.

The many large chemical firms that had instituted early-retirement programs to trim thousands of employees from their staffs could hardly have engaged in the brisk hiring that would have greatly helped the many chemical professionals who graduated this year from U.S. universities.

An indicator of the depressed job market for chemical professionals is the somewhat increased unemployment rate this year among members of the American Chemical Society and the American Institute of Chemical Engineers.

Continuing Education

Chemical firms are expanding their continuing education programs to improve the creativeness of their employees and to prevent them from falling behind in their professional knowledge.

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Demand

The employment market for chemists and chemical engineers was disappointing this year, and many observers foresee little or no improvement in the situation in 1987.

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Salaries

Median annual salaries of experienced chemists increased this year at all degree levels. Preliminary data show a decline in the salaries of inexperienced B.S. chemists.

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Career Planning

The American Chemical Society and other organizations can provide a variety of useful information to people seeking advice about careers in chemistry and chemical engineering.

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Demand

Cutbacks by employers in hiring of technical people have made job hunting more difficult this year for chemical professionals

Demand for chemists this year has been no cause for elation. Chemistry department spokesmen report that hiring of 1986 graduates, especially at the B.S. level, was "sluggish," "somewhat worse than last year," or "about the same as last year, which was not a particularly good time either."

As for chemical engineers of the class of 1986, demand for their services was better than it was a few years ago, but still a cause for concern. Chemical engineering departments report that 20 to 50% of their 1986 B.S. students did not have jobs when they graduated but were looking for them. This is in sharp contrast to the picture 10 or more years ago, when about every new job-seeking B.S. chemical engineer had a job at graduation.

The employment market for

Ph.D. chemists and chemical engineers is better. At most schools, the vast majority of such Ph.D.s who wanted jobs found them, although some received only one offer. In former years, Ph.D.s in chemistry or chemical engineering typically could take their pick of several job offers.

Diminished demand for chemical professionals in 1986 also is reported by many leading chemical companies. The College Placement Council finds that the number of job offers received by chemists and chemical engineers is noticeably less in 1986 than in 1985. Unemployment among members of the American Chemical Society and the American Institute of Chemical Engineers is higher this year than last. The volume of position-open advertising in C&EN this year is less than in 1985, also reflecting reduced demand for chemical professionals.

A variety of reasons are blamed for below-normal demand for chemists and chemical engineers. In the recent past, low profits have led many companies to cut back on hiring of all types of employees, including scientists and engineers. Several years ago, when profits were considerably better and companies were growing rapidly, many firms tended to hire more people than they really needed. Now that revenues are much tighter, employers are under considerable pressure to trim their staffs.

Many companies have been making determined efforts to increase productivity and efficiency, which boils down to achieving at least the same results with fewer people and less spending. Employers talk about running operations that are "leaner and meaner" and are stepping up efforts to combat competition from both the U.S. and abroad.

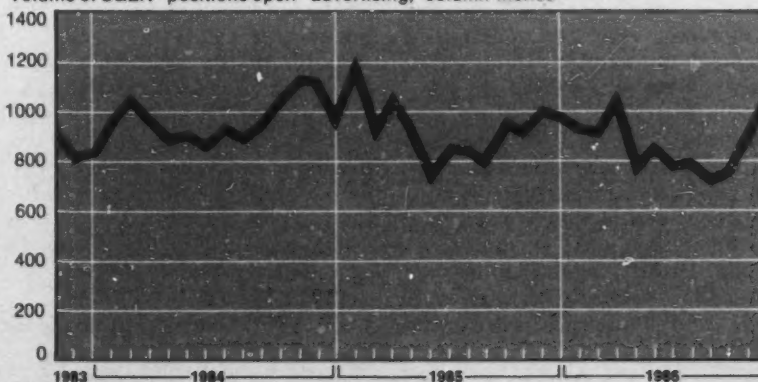
One major reason for currently disappointing job prospects for chemists and chemical engineers is the serious economic problems in the petroleum industry, which traditionally has employed large numbers of such professionals. These problems, of course, are related to recent sharp declines in the price of crude oil, as well as of gasoline and other petroleum products. These declines have cut deeply into profits of petroleum companies, forcing them to reduce staffing.

Likewise, reduced hiring has become commonplace in the chemical industry. In the past year or so, many firms have offered incentives to encourage the voluntary early retirement of thousands of their employees, including such major firms as Union Carbide, Du Pont, Monsanto, Eastman Kodak, and Dow Chemical. Newly retired chemical professionals often are competing with newly graduated counterparts in the job market.

Also making job-hunting more difficult for new chemistry and chemical engineering graduates is

Help-wanted ads below early-1985 high, despite upturn

Volume of C&EN "positions open" advertising, * column-inches



* Column-inches published during consecutive periods of four weeks each; no issues were published in the last week of December 1983, 1984, and 1985.

the increasing number of mergers in the chemical and petroleum industries, such as Monsanto and Searle, Chevron and Gulf Oil, and Du Pont and Conoco. Almost inevitably when two companies merge, staff-cutting results to eliminate unnecessary overlapping of functions.

Most university chemistry departments contacted by C&EN indicate that 1985-86 graduates had a harder time finding jobs than did graduates in 1984-85. Audrey L. Aylesworth, placement coordinator in the chemistry department of the University of Wisconsin, Madison, reports that its B.S. graduates averaged 1.4 job offers in 1985-86, compared to 2.1 in the previous academic year. The average number of job offers was 1.5 for Ph.D. graduates in 1985-86, down from 2.6 in 1984-85, and 3.1 in 1981-82.

Aylesworth states that, from talking with recruiters, she got the impression that many companies interviewing the chemistry department's graduates were doing so not to expand their research staffs but rather to find a few specialized people to replace those who had retired or resigned in the past year.

She also believes that the job market for chemists at the University of Wisconsin, Madison, might have been worse in 1985-86 if it were not for the fact that the number of candidates seeking industrial employment was less than in the previous academic year. In 1985-86, the number of Ph.D. candidates using the placement service was only 29, compared to 39 in 1984-85.

At the school of chemical sciences of the University of Illinois, Urbana, (which includes both chemistry and chemical engineering) the number of employers who visited the campus to interview graduating students was 22% less in 1985-86 than in 1984-85. Because quite a few students could not get as many on-campus interviews as they wanted, the number of résumés that the school mailed directly to employers (the so-called "overflow") was 82% greater in 1985-86 than in the previous academic year.

Rebecca J. Simon, placement director of the school of chemical sciences, reports that 14% fewer job offers were made to graduating Ph.D.

chemists in 1985-86 than in 1984-85. On the other hand, 65% more job offers were made to B.S. chemists in 1985-86 than in 1984-85. She attributes the brighter fortunes of B.S. chemists partly to the fact that many of them looked for and accepted jobs in such nonresearch areas as sales, marketing, or technical service.

Nevertheless, many B.S. chemists graduated from Illinois with considerable uncertainty about their futures. Only 62% had reported definite plans at graduation to take jobs, begin graduate work in chemistry, or enter medical or dental school. The percentage of 1986 B.S. chemical engineers who also had reported definite plans was slightly lower—58%.

A few Illinois students who graduated this past spring had accepted job offers from petroleum companies in late 1985. Within a few months, however, they found that their offers were withdrawn because of worsening business conditions or were told that they would be the first to be let go in the event of a company layoff. These students, Simon says, were placed in a serious predicament because, by this time, on-campus recruiting had practically come to an end.

R. Bryan Miller, chairman of the chemistry department at the University of California, Davis, describes the job market for its 1985-86 B.S. graduates as "soft," certainly not so good as it was three or four years ago. Although some of the students who were not going on for postgraduate study did not have jobs when they graduated, all of them have jobs now, Miller believes.

As for the department's 1985-86 Ph.D. graduates, almost all now have permanent jobs or postdoctoral positions. Almost none of the department's recent graduates got jobs with petroleum companies, which in the past had hired significant numbers of them, particularly because of the university's location on the West Coast.

At the University of Colorado, says Bert M. Tolbert, associate chairman of the chemistry department, B.S. chemists who graduated last spring found jobs slightly more difficult to get than did such chemists

in the spring of 1985. The employment market was strong for Ph.D.s in analytical chemistry, he says, but unchanged for Ph.D.s in other chemical disciplines.

Quite a few of the department's graduating B.S. chemists in 1985-86 did not bother to look for jobs until after graduation. One reason may have been a preoccupation with studies or a belief that they could rely on their affluent parents to support them until they found employment. Another explanation is their discouragement over the state of the job market.

The number of companies that sent recruiters to the University of Michigan's chemistry department fell 13% from 1984-85 to 1985-86. Plant visits made by recent graduating students and the number of job offers they received also have decreased noticeably. On the other hand, more campus visits are being made by recruiters from companies involved in solving toxic waste disposal problems. "This," says Leah C. Atwater, director of the department's student services, "is obviously a growth area for chemists."

In the face of a weak job market, graduating chemistry students, Atwater indicates, are having as many campus interviews as possible. They also are mailing out considerably more résumés than usual to companies on their own. "Clearly, they are working much harder at getting a job," she says.

Demand for 1985-86 chemistry graduates at the University of Massachusetts, Amherst, was "spotty and not as strong as in 1984-85." Robert L. Rowell, chemistry professor and until recently acting department head, notes that company recruiters seemed to know precisely what kinds of people they wanted to hire and were unusually selective in making job offers. The sharp economic downturn in the petroleum industry, he says, "practically wiped out hiring of chemists by some oil companies and also resulted in the firing of chemical employees. The situation was a disaster."

The job market probably is even more disappointing for new chemical engineers. At Texas A&M, only about half of the 1985-86 B.S. chemical engineers had jobs when they

Demand for chemical professionals declines this year

The job market for both chemists and chemical engineers is clearly less active in 1986 than in 1985. A recent C&EN survey of 25 employers of chemical professionals indicates that they intend to hire 25% fewer chemists and that 14% fewer chemical engineers will be hired this year compared with last year. On the other hand, the employers surveyed plan to hire 22% more chemists and 13% more chemical engineers in 1987 than in 1985.

One company representative comments, "We find that we work better with leaner staffing." Another employer adds, "The continued low growth in the chemical industry and depressed crude oil prices have dictated moderation in our hiring of chemists." "Our sales volume has not increased enough to encourage us to enlarge our staffs in research and manufacturing," another observes.

But looking at future demand for chemists, one company spokesman states, "Our hiring of chemists next year should be back up at the 1985 level." Another predicts "an upturn in

our hiring next year." A third comments, however, "In 1987, we plan to hire only replacements to maintain the current size of our technical staff."

The prevailing business climate has affected their hiring of chemists greatly, nearly half of the survey respondents admit. Only 20% think it has had slight impact or none at all.

Most of the employers of chemical professionals surveyed by C&EN are chemical or petroleum companies; a few are research firms. These organizations, as of mid-1986, employed about 13,000 chemists and about the same number of chemical engineers. Women accounted for about 17% of the chemists and about 12% of the chemical engineers.

About 63% of the chemists they plan to hire this year will be new graduates, compared to 56% last year. Of the chemical engineers they plan to hire this year, about 76% will be new graduates, compared to about 80% in 1985. Says one employer, "Prevailing business conditions in the chemical field have reduced our hiring of inexperienced chemists. Instead, we are

tending to hire experienced candidates to replace employees who have resigned or retired."

The organizations surveyed made 4% fewer visits to college campuses to recruit chemists in 1985-86 than in 1984-85 and expect visits in 1986-87 to drop another 3%. In their search for chemical engineers, 10% fewer visits were made to college campuses in 1985-86 than in the previous academic year and 2% fewer visits will be made in 1986-87 than in 1985-86.

More than 80% of employers are seeking specialists in particular fields of chemistry. The specialists most frequently cited are (in decreasing order) organic chemists, analytical chemists, polymer chemists, physical chemists, and biochemists.

Asked what the employment outlook for chemists will be in their organizations during the next five years, 17% said it is excellent or very good, 81% said good, and 22% fair. For chemical engineers, 23% said the job outlook is excellent or very good, 50% said good, and 27% fair. None think the outlook for chemists in their firms is poor.

graduated, although the vast majority of them were looking for industrial employment. The situation was about the same as in 1984-85. Ronald Darby, professor of chemical engineering at Texas A&M, points out that some B.S. chemical engineers who graduated in May 1986 are still looking for jobs.

The task of finding a position does not appear to have been eased, he says, by the decreasing number of B.S. chemical engineering graduates. Texas A&M awarded B.S. degrees to 138 chemical engineers in 1983-84, but to only 100 in 1985-86. It expects the number to drop to 50 in 1986-87.

The size of the graduating class is expected to decline still further in the years ahead. Darby mentions that the current freshman class in chemical engineering has less than 100 students. At its peak in 1981-82, the freshman class numbered about 350.

Because of the tight job market, some of the university's recent grad-

uating B.S. chemical engineers have had to accept unconventional jobs, says Darby. One or two have taken positions with state environmental agencies. Some have gone into real estate or have joined family-owned businesses.

The chemical engineering department at Virginia Polytechnic Institute & State University reports that the employment situation for its B.S. graduates has improved in the past few years but is still less than satisfactory. William L. Conger, head of the chemical engineering department, says that the percentage of B.S. graduates who had jobs or were planning to enter graduate school at the time they got their degrees in May rose from about 30% in 1983 to 70% in 1985 and 1986. The figure is also expected to remain about 70% in 1987.

At the same time, B.S. graduating classes in chemical engineering at Virginia Tech are shrinking. The department graduated about 90 B.S.s in 1985 and 75 in 1986. Next

year, it expects to graduate about 50. Conger believes that this decrease thus far has had little effect on the number of new graduates who are able to find industrial jobs. The impact of such shrinkage, however, may well be felt in the years ahead, he says, if the number of graduates falls to seriously low levels.

Of 32 B.S.s who graduated from Cornell University's school of chemical engineering in 1985-86, 13 had jobs at graduation, 14 planned to go to graduate school (in some cases, because they had gotten no job offers), and five were still looking for positions. Citing the companies that had hired its 1985-86 B.S. graduates, the school's recent newsletter states pointedly, "Note the absence of oil companies in this list."

Cornell also has been graduating fewer B.S.s in the past few years. It awarded only 32 B.S. degrees in 1985-86, down from 59 in 1984-85.

The downturn in demand for chemists and chemical engineers

Undergraduate degrees decline slightly while slightly more graduate degrees are awarded in chemistry

Academic year	Degrees awarded in chemistry ^a			Degrees awarded in chemical engineering		
	Bachelors	Masters	Ph.D.s	Bachelors	Masters	Ph.D.s
1973-74	10,525	2138	1828	3454	1045	400
1974-75	10,649	2006	1824	3142	990	346
1975-76	11,107	1796	1623	3203	1031	308
1976-77	11,322	1775	1571	3581	1086	291
1977-78	11,474	1892	1525	4615	1237	259
1978-79	11,643	1765	1518	5655	1149	304
1979-80	11,446	1733	1551	6383	1271	284
1980-81	11,347	1654	1622	6527	1267	300
1981-82	11,062	1751	1722	6740	1285	311
1982-83	10,746	1604	1746	7145	1304	319
1983-84	10,704	1667	1774	7475	1514	330
1984-85	10,550	1680	1875	7000	1350	335

^a Data do not include biochemistry and geochemistry. ^b C&EN estimates. Source: Department of Education's National Center for Education Statistics

shows up in figures from employers themselves. An unusually dramatic example of this is reported by Du Pont, which hired only about 30% as many chemists in 1985-86 as in 1984-85 and only about 40% as many chemical engineers. In 1986-87, however, Du Pont expects to return hiring of chemical professionals to 1984-85 levels.

Robert K. Armstrong, manager of professional staffing at Du Pont, says that the sharp cutback in chemical hiring in 1985-86 reflected a major companywide effort to increase productivity. As part of this effort, Du Pont temporarily instituted a voluntary early-retirement program.

Thomas J. Neelan, manager of university relations at Union Carbide, says Carbide's hiring in 1985-86 dropped because of a concerted company effort to reduce overall staffing and operate more efficiently. To reduce its employment, Carbide also adopted a temporary early-retirement program.

Ted J. Logan, manager of Procter & Gamble's Ph.D. recruiting, notes that many major companies these days are increasing their emphasis on life sciences and various engineering disciplines, with a corresponding decrease in emphasis on chemistry. As a result, they currently are tending to hire fewer chemists and more life scientists (pharmacologists, cell and molecular biologists, biochemists, immunologists) and engineers (chemical, ceramic, electrical, and bioengineers).

Most observers believe that the job market for chemists in 1987 either will be about the same as in 1986 or will be slightly better. Aylesworth of the University of Wisconsin, Madison, foresees "no great upturn or downturn." Simon of the University of Illinois comments, "I think we can expect about the same amount of recruiting activity in 1987 as in 1986, even though my industrial contacts are indicating that hiring will be up slightly."

Atwater of the University of Michigan comments, "I am guardedly optimistic that we will see a modest improvement in the employment picture for chemists in 1987." Rowell of the University of Massachusetts, Amherst, predicts, "The job market should be slightly better in 1987. Assuming the price of oil increases and profits in the petroleum industry improve, petroleum companies next year should start hiring more people, including chemists."

Less optimistic, one company spokesman believes that industry's demand for Ph.D. chemists will be about 10% less in 1987 than in 1986, mainly because of disappointingly low R&D budgets, relatively poor company profits, and inadequate cash flow. The task of finding a job will be especially difficult, he says, for Ph.D. chemists who are in the bottom quarter of their class academically or are from less prestigious schools.

As far as the market for new chemical engineers is concerned,

Darby of Texas A&M notes, "I don't expect the job situation for our B.S. chemical engineers to be any worse in May 1987 than it was in May 1986. In fact, it may be a little bit better. According to my discussions with recruiters from both the chemical and petroleum industries, the job market appears to have leveled off or improved somewhat." Conger of Virginia Tech reports, "The recruiters I have spoken with in recent months say that the demand for new chemical engineers in 1987 will be about the same as in 1986."

William Dausses, director of employment and placement at Phillips Petroleum, observes, "The demand for chemical engineers should improve slightly next year, as the need for their talent increases among companies involved in chemical manufacture, petroleum refining, R&D, pollution abatement, and so on."

In its latest employment report, covering 12-month periods, the College Placement Council indicates that new B.S. chemists received 12% fewer job offers as of July 1986 than as of July 1985. New Ph.D. chemists received 36% fewer offers. B.S. chemical engineers got 37% fewer offers and Ph.D.s 44% fewer.

As of July 1986, the B.S. scientists who received the most offers were computer scientists and mathematicians, according to the council. The B.S. engineers who fared best were electrical (including computer) engineers and mechanical engineers.

The council also reports that, as of July 1986, male B.S. chemists received the same number of job offers as they did in the 12 months ending July 1985, but women B.S. chemists got 22% fewer offers. Male B.S. chemical engineers got 35% fewer offers as of July 1986, and women B.S. chemical engineers received 41% fewer.

As further evidence of the weakening job market for chemists, the overall unemployment rate for ACS-member chemists rose from 1.4% on March 1, 1985, to 1.7% on March 1, 1986. The unemployment rate for ACS-member chemists on March 1, 1986, was 2.6% for B.S. chemists, 1.7% for M.S.s, and 1.3% for Ph.D.s, compared to 2.0% for

B.S.s, 1.6% for M.S.s, and 1.1% for Ph.D.s on March 1, 1985.

The American Institute of Chemical Engineers likewise reports that the overall unemployment rate among its members rose from 2.8% in February 1985 to 3.2% in February 1986. The comparable figure was 4.3% in February 1983, when unemployment among AIChE members was at the highest level since the institute began surveying its members in 1971.

Audra B. Rafter, manager of the ACS Employment Aids Office, which operates the ACS National Employment Clearing House, describes the atmosphere and general feeling among employers and job applicants at the latest clearinghouse at Anaheim, Calif., in September as better than at the clearinghouse in Chicago in September 1985. Especially noteworthy, she says, is the fact that the number of employer representatives at Anaheim was 217, which was higher than expected in light of the slow employer activity earlier in the year.

At the Anaheim clearinghouse, the types of job applicants that recruiters were primarily interested in were analytical chemists (110 positions listed), organic chemists (44), polymer chemists (41), biochemists (27), chemical engineers (22), physical chemists (16), and teachers (14).

The volume of "position-open" advertising in C&EN this year also reflects a downturn in the demand for chemical professionals. The number of column-inches of such advertising in the first 44 issues of 1986 was 9534—6% lower than in the first 44 issues of 1985.

Deutsch, Shea & Evans, a human resources advertising firm, reports that its high-technology recruitment index (based on the volume of recruitment advertising directed to scientists and engineers) rose from 105 in July 1985 to 116 in February 1986 but then fell to 105 in July (a slight increase from 103 in the previous month). Marjorie Freedland, vice president of DS&E, comments, "We'll have to wait until the major corporations have stopped trimming their technical staffs before we can announce that the long-awaited turnaround in technical recruitment has begun." □

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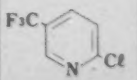
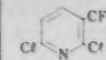
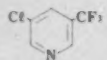
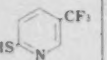
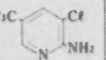
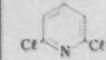
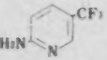
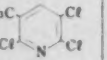
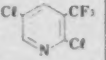
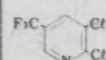
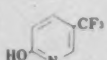
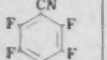
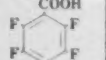
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